TWO CLINICAL "LECTURES"

BY

ALEXANDER MORISON, M.D.EDIN., F.R.C.P.EDIN.,

PHYSICIAN TO OUT-PATIENTS AT THE GREAT NORTHERN CENTRAL HOSPITAL AND AT THE CHILDREN'S HOSPITAL, PADDINGTON GREEN, LONDON; MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON; FELLOW OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, AND OF THE MEDICAL SOCIETY OF LONDON; MEMBER OF THE CLINICAL AND PATHOLOGICAL SOCIETIES OF LONDON, ETC.

A CANDIDATE

FOR THE

CHAIR OF CLINICAL MEDICINE

IN THE

UNIVERSITY OF GLASGOW.

Reprinted from the 'Lancet,' May 19th, and June 30th, 1900.

LONDON:
ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20 HANOVER SQUARE, W.
1900.

TWO CLINICAL "LECTURES."

BY

ALEXANDER MORISON, M.D.EDIN., F.R.C.P.EDIN.,

PHYSICIAN TO OUT-PATIENTS AT THE GREAT NORTHERN CENTRAL HOSPITAL AND AT THE CHILDREN'S HOSPITAL, PADDINGTON GREEN, LONDON; MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON; FELLOW OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, AND OF THE MEDICAL SOCIETY OF LONDON; MEMBER OF THE CLINICAL AND PATHOLOGICAL SOCIETIES OF LONDON, ETC.

A CANDIDATE

FOR THE

CHAIR OF CLINICAL MEDICINE

IN THE

UNIVERSITY OF GLASGOW.

Reprinted from the 'Lancet,' May 19th, and June 30th, 1900.

LONDON:
ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20 HANOVER SQUARE, W.
1900.

I.

A CLINICAL STUDY OF THE CAUSES OF THE FIRST SOUND OF THE HEART.[1]

MR. PRESIDENT AND GENTLEMEN,—In the beginning of 1896, when in charge of my colleague Dr. C. E. Beevor's beds in the Great Northern Central Hospital, the following case was admitted under my care, and to some points in it I wish to refer in connection with the theme of this paper.

A housemaid, aged 22 years, was admitted into the hospital on January 6th, 1896. She was stated never to have had any serious illness until about two months previously, when she manifested shortness of breath, lassitude, and loss of appetite, together with a progressive anæmia. About three weeks later the acute phase of her illness began, when she complained of pains in the abdomen, vomited daily, had headache, was feverish, and at night was somewhat delirious. She steadily became worse, refusing food and losing weight until the date of her admission. On admission she was found to have tenderness in the left hypochondriac region. The area of splenic dulness was increased downwards and forwards two-thirds of the way to the umbilicus, but could not be palpated on account of reflex rigidity of the abdominal muscles induced by the ex-

[1] A paper read before the Medical Society of London on May 14th, 1900.

cessive tenderness to touch. The other abdominal organs presented nothing notably abnormal except the kidneys, the urine showing a trace of albumin and having a specific gravity of 1018. The examination of the lungs gave a negative result, but respiration was very rapid and shallow, being at the rate of 84 to the minute. The heart's action was also very rapid but regular, and its impulse was recorded as heaving and in the nipple line. The heart-sounds were also described as having been "loud" and without bruit. The pulse was soft, regular, and had a rate of 150 to the minute. There was some œdema of both feet. The patient was conscious, had equal pupils which reacted to light, exaggerated knee-jerks, continuous ankle tremor of a neurasthenic type, and well-marked superficial reflexes generally. The temperature was 101·8° F., and there was no cutaneous eruption.

It is not necessary in the present connection to enter with much detail into the subsequent clinical history of the case other than that affecting the heart-sounds, beyond stating that the temperature ranged between 97° and 103° until the two days preceding death, when it fell as low as 95°, rising on the day of death (January 16th) to 98·5°; that the area of hepatic dulness increased; and that a loud superficial friction, manifest on auscultation, appeared over the gastro-hepatic area which was shown at the necropsy to be transmitted from the peri-splenic region through the intervening organs which acted as conductors of sound.

As regards the cardio-vascular signs the following facts were noted. On January 11th the first note is made of the condition of the heart after the record made on admission, when the sounds are described as being "very loud and hollow" and associated with a "slight systolic bruit at the apex." On the 12th it is written that there was a "very high-pitched systolic

bruit at the apex quite different in quality from that observed the day before, and that "the pulse and respiration continued very rapid." On January 15th the pulse, it is stated, could only just be felt at the wrist and the heart-sounds are described as good and the action as regular and at a rate of 108. The respiratory rate was 60, and the abdomen moved with the descent of the diaphragm. The morning temperature was normal, and fell to 95·4° on the same evening. The patient was then dying from exhaustion, and on the next day died. The necropsy was made by the pathologist to the hospital (Dr. Freyberger) on January 17th, twenty hours after death. All the organs of the body were healthy with the exception of the spleen, the heart, and the kidneys, and the description of these I copy *verbatim* from the register.

"*Spleen*, double size, firmly adherent to peritoneum by means of perisplenitic pseudo-membrane; a large anæmic infarct running like a band across the whole of the sub-surface. A smaller cone-shaped one near the apex. No suppuration. Consistence somewhat increased.

"*Kidneys*.—Both cloudy. Capsule not stripping readily. Cortex diminished. Glandular structure indistinct. A small anæmic infarct. No metastatic abscess.

"*Heart*.—In the pericardial cavity about six ounces of clear serum. A somewhat recent pericardial adhesion posteriorly about half way between the coronary sulcus and the apex; a much older one (which has evidently become detached) at a similar place anteriorly. There are milky spots anteriorly over the right ventricle. Right ventricle.—On section muscle about a quarter-inch thick, healthy looking, consistence not diminished.

Pulmonary valves competent, natural. Tricuspid natural; admits three fingers. Loose clot and much fluid blood in right ventricle. Right auricle natural. Left ventricle somewhat contracted. On section muscle half an inch thick, of a greyish-red colour, consistence not diminished. On the left lateral semilunar valve a large lump of coagulated fibrin of a verrucose appearance, taking up the entire ventricular surface and dragging the valve downwards. The fibrinous deposit is continued on to the right lateral aortic valve, which with its anterior half participates in the formation of this excrescence, which sends a long, free, tongue-like process down into the ventricular cavity. A similar verrucose excrescence the size of a pea, on the posterior valve, occupying the site of the nodulus Arantii. Mitral valves.—The mitral cusps are both involved in the process, the valves shortened, and their free edge covered with more cauliflower-like excrescences, which are especially extensive on the auricular surface of the aortic cusp and the right half of [the] posterior cusp. The valves are nowhere perforated, the chordæ tendineæ of [the] aortic cusp shortened, and on some of them there is also precipitation of fibrin in consequence of peri-tendinitic roughness. The posterior auricular surface roughened and puckered, with some lamellar fibrinous precipitate in places."

This case was evidently one of so-called malignant endocarditis, ingrafted in an anæmic subject upon old and extensive lesions of the aortic and mitral valves, probably of rheumatic origin, although no history to this effect could be elicited. The clinical observations were made by myself and by Mr. Randall Wadd, who had been house physician to the Brompton Hospital for Consumption before coming to the Great Northern Central Hospital. I mention these particulars to increase the value of the observations which refer to the general clearness

and audibility of the heart-sounds. This condition attracted my attention the more because I had at that time recently assisted the late Sir Richard Quain in the preparation of a paper which he read before the Royal Society on June 3rd, 1897, on the mechanism by which the first sound of the heart is produced. In the case I have recorded, except upon the rare occasions on which a systolic bruit was heard at the apex, both sounds were, as has been stated, clear and even, as the notes tell, "loud" and without bruit. After the evidence of destruction in the aortic and mitral valves revealed at the necropsy it became a matter of interest to discover where and how these apparently normal sounds originated. That the clear second sound could only arise at the pulmonary arterial orifice was manifest, and its clearness or loudness were probably in a measure due to abnormal tension in the pulmonary circuit and the absence of disturbing murmur in the left heart together with its superficial position. But the explanation of the clear *first* sound was as much a puzzle to me as a clinician as the satisfactory explanation of the first sound of the heart still is to many experimenting physiologists. I therefore thought some light might be thrown upon the cause of this sound by studying it from the clinical point of view and have examined a number of cases with this object. A large proportion of these cases were taken from my clinic at the Paddington Green Children's Hospital as a matter of personal convenience rather than of choice, but the circumstance is not to be regretted because of the variety such subjects present and the ease with which sounds are conducted through their chests. The younger the child, indeed, the more easily are both heart-sounds radiated all round the chest, but there are of course points at which one or other sound has its position of maximum audibility. In the case of the first sound, as we know, this is at

the apex of the heart, and in the case of the second at the base. The general principle that a greater noise obscures a less is true in the case of the heart as in that of all other substances or media which are resonant. The possible media for the generation and conduction of sound in the case of the heart are its fibrous structure and valves, its muscle, the blood circulating through the organ, and the thoracic case which contains the whole with its solid and gaseous contents and surroundings. We may shortly consider these possible factors *seriatim.*

1. As regards the valves. In the case of mitral systolic bruit both sounds may be universally audible in front, even including the apex area, when the bruit is not loud, and in this case to the right of the sternum both sounds may be heard without associated bruit. This may be so even when regurgitation through the valve is sufficiently marked to be audible in the left paravertebral groove. But in such case the second sound is not audible in the back. When the second sound is audible in the back in mitral regurgitation, it is usually at the level of the scapular spine and denotes accentuation of that sound and all that that implies. When the second sound is thus accentuated the first sound is usually obscured, and systolic bruit and the evidences of dilated hypertrophy are generally well marked. When the mitral bruit is presystolic in time and even associated with presystolic thrill both sounds may be universally audible in front unless the noise of the bruit be considerable, in which case the first sound is masked and the second audible as a simple or reduplicated sound. In the case of a double mitral bruit both sounds may be audible outside the apex area, while the second may be heard at the apex and in both paravertebral grooves.

With aortic systolic bruit the first sound may be obliterated in the aortic area and the second heard, while both may be audible in the pulmonary area and also in front, provided the systolic bruit be not very loud. Both sounds may also be distinctly audible all over the præcordia when the aortic bruit is diastolic, unless the diastolic bruit be loud, when the second sound is as universally masked. If with a loud diastolic bruit the heart suddenly fails, as it does in anginous attacks, the pulmonary second sound becomes audible and even accentuated and is again masked when the bruit returns with the recovery of the heart. In double aortic bruit there is most abolition of the heart-sounds because the noise is often considerable. With fair ventricular systolic force, however, in these cases, the closure of the pulmonary valve is usually marked by a detectable second sound. When an aortic systolic bruit is associated with a mitral systolic bruit the second sound may be clearly audible, both noises being systolic. The same is true of systolic pulmonary murmur with tricuspid regurgitation, of which I have observed one case verified by post-mortem examination. In this instance, however, the aortic second sound could only occasionally be detected with difficulty on account of a diastolic pulmonary bruit being also present. Hæmic systolic bruits at the base of the heart may conceal the first sound to one or both sides of the sternum, but in such case both sounds are easily audible at other points of the præcordia. In cases of congenital malformation of the heart when bruit is present it is usually (always so far as my experience goes) systolic, and if loud may mask the first sound, but not by any means invariably. Even when the systolic bruit is loud the first sound may at times be easily heard through it. The second sound is usually very distinctly audible, because accentuated, and both may be heard over a

wide area. Thus in the case of a patient under my care in the Children's Hospital there was a loud systolic bruit best heard over the cartilage of the fourth left rib, but both sounds could be heard universally over both the front and back of the chest with remarkable clearness, although the first sound was masked but not lost in the area of loudest bruit. On the other hand, considerable congenital defects may be present, as shown by subsequent necropsy, and even in association with well-marked cyanosis, without presenting any bruit. In such cases both sounds may be widely heard and only differ from the normal in exhibiting an accentuation proportionate to the cardiac hypertrophy and vascular impediment present.

2. As regards the influence of the cardiac muscle in the production of sound. The force of systole in modifying the pitch or audibility of bruit is a well-known fact. To detect an indistinctly marked bruit we often cause the patient to walk about or exert himself in some manner to increase the force of systole and with it the audibility of murmur. It may frequently be observed also that as the force of systole wanes bruits usually easily detected and of an average and steady pitch become less audible or even lost. In the stage of exhaustion in protracted fevers the audibility of the first sound is frequently much impaired. This is also the case in feeble persons in advanced life and during failure of the circulation from anæsthetics or other cause. In all these cases the second sound is usually more audible than the first if the arterial valves be entire.

3. The clinically observable influence of the blood in the production of sound and in the obscuration of sounds is perhaps the most easily determinable of all the factors mentioned so far. The weakening of the heart-sounds from loss

of blood in surgical and obstetric practice is too well known a phenomenon to call for further comment, while the possible loudness of bruits or noises at defective orifices has been sufficiently emphasised in a previous section. In the case with which I opened this paper, indeed, the peculiar audibility of the heart-sounds was no doubt chiefly owing to the abolition of the bruits in the left ventricle by the failure of impulse in the circulation, although this does not explain fully either where or how the persistent sounds were originated.

4. The fourth and last factor which I have to mention in connection with a clinical study of the cause of the first sound of the heart is the possible influence of the thoracic case in which the sound-producing organ is contained. All clinical conditions may be regarded as ready-made natural experiments for the study of the physician, but on this point nature at times makes an experiment which is as artificial as any performed in the physiological laboratory. Personally, I have never had an opportunity of observing a case of ectocardia, but such have fortunately been carefully studied. Mr. C. G. Grant observed a case in 1896, an account of which with an accompanying photographic illustration may be seen in the *British Medical Journal* of December 5th of that year (p. 1639). In this case, which was that of a fœtus born alive about the eighth month and which lived for six hours, the heart, which was "external to the chest wall" and devoid of pericardium, pulsated vigorously. The sounds at the base were clear and distinct, no murmur being audible; auscultation at the apex was, it is stated, "impracticable owing to the exaggerated movements." The influence of the chest-wall in contributing towards the sounds of the heart as determined at the bedside may therefore be set aside as a negligible or

inoperative quantity. Where, then, and how did the clear heart-sounds in my case originate? In the first place, where?

As has been already stated, there can be little doubt that the second of the two normal sounds detected originated at the pulmonary arterial orifice, for the aortic valves were too much diseased for competent closure. The situation of the first sound heard remains to be determined. As has been mentioned the sounds were recorded at times as peculiarly "loud." Now it is a characteristic of noises at the pulmonary arterial orifice that they are very easily heard on account of that vessel being comparatively near the surface. With the accentuated *clacquement* of the second sound at that orifice we are all familiar. It is loud to the ear and palpable by the hand. It may, indeed, be used when thus marked for determining the position of the base of the heart without other aid. Bruits at the same orifice, though rarely observed, are loud and easily perceptible, and may be associated, as in a case which I published in the Transactions of the Pathological Society (1876), with a very coarse thrill. Similarly other sounds originating in the right ventricle if freed from obscuration by competitive noises might be expected likewise to be distinctly audible. In my case this freedom from competitive noise might be supposed to be secured by the feebleness of ventricular action in the diseased left ventricle, which, together with the reduced aortic pressure from valvular reflux, prevented the generation of bruit at the defective orifices. It may be asked, then, if the left ventricle were so greatly disabled whether the right did not also share its enfeeblement; and this must undoubtedly have been the case. If, therefore, the first sound originated in the right ventricle it must at any rate mainly have been due to some circumstance or circumstances other than contraction of the

cardiac musculature of that chamber. What was this circumstance, or, it may be, what were these circumstances? This leads to the consideration of how the first sound of the heart originated if it be assumed or granted that it arose chiefly in the right ventricle, as seems probable.

In making a few remarks upon this point I desire to avoid all appearance of dogmatism and merely wish to mention some circumstances as premisses which appear to lead to a rational conclusion. The argument will be from the known to the unknown, or, at all events, the disputed. My case, merely taken as an example, shows that either series of semi-lunar valves may alone be the site of the second sound of the heart, because the aortic valves were quite incompetent in that case and therefore silent. When the second sound is accentuated, moreover, the sound may be felt to be coincident with closure of the semilunar cusps if the hand be placed on the chest while the ear listens through the stethoscope. The second sound, therefore, is due chiefly to an incident in diastole, not to diastole as a whole. It appears possible, therefore, that some incident in systole and its surroundings may play a greater part than others in the production of the first sound of the heart. The possible factors have already been stated to be: (1) the valvular and fibrous structures of the heart; (2) its muscular action; (3) the blood waves; and (4) the thorax.

As regards the first point, we have seen that the first sound may be audible in all forms of valvular disease at one or other part of the chest unless obscured by bruit, which is a very different matter from being abolished or replaced by such. Even hæmic bruit without any valvular incompetence may obscure the first sound of the heart. There is, however, a fallacy involved in drawing a positive conclusion from this consideration, because to exclude the participation of the valvular

structures from taking part in the production of the first sound there should be evidence of all four being greatly incompetent at the same time. Such a condition if present in considerable degree would be incompatible with any but the shortest life, and I am not aware that it has been observed by the clinician or even by the experimental physiologist, although I have myself known the aortic, mitral, and tricuspid valves to be simultaneously much disorganised. But even if all the valves were diseased at one time the character as well as the degree of the disease would have to be taken into consideration in deciding the point, for the stiffened flaps of an indurated valve may be an excellent vibrating structure, or serve in a great measure to divide the blood-stream as under normal circumstances. It is certain that the first sound may be audible when representative valves (auriculo-ventricular and semilunar) are diseased, but some share in the generation of the first sound of the heart on the part of the valvular structures cannot be excluded as a result of clinical observation, although that share has probably been over-estimated.

As regards the muscular factor my case proves that the first sound of the heart may be clearly audible when the muscular force of the ventricles is at zero. Congenital cases, moreover, show that gaps in the cardiac septa do not interfere with the generation of a normal first sound, although resulting bruit may at some points obscure it. Sound emitted by the cardiac muscle seems, therefore, on clinical evidence, not to be an important factor in the production of the first sound of the heart as conveyed to the ear by the stethoscope.

The influence of blood waves, on the other, hand in producing sound is clearly shown by the character and variation of the bruits or noises which arise when the blood current is transmitted through diseased or malformed apertures. As, moreover,

the distinction between a noise and a tone is merely one of vibration, and the fluid medium—the blood—is that to which such vibration must in greatest measure be communicated, the important part played by the blood itself in the production of the first sound of the heart appears on clinical grounds to be unquestionable.

The last point which has to be weighed—namely, the influence of the thorax, the air-containing cavity which holds the heart—in producing the first sound, is easily disposed of. Mr. Grant's case already quoted proves not only that the chest wall has little or nothing to do with the production of the sounds of the heart, including the first sound, but also reveals another very interesting fact—namely, that both sounds may be clearly audible in cases of ectocardia at the base of the heart, when the apex from its mobility is incapable of being satisfactorily auscultated. Were it possible to place the whole mechanism in vacuo without the heart ceasing to pulsate, no doubt all sound to the ear would be abolished, very much as the movements of a watch would cease to be audible under like circumstances. But the general question of the conductive power of air may be dismissed as foreign to the present inquiry. In Brakyn's [1] apparatus air took the place of blood and emitted the systolic and diastolic sounds. In nature blood takes the place of air.

The conclusion, therefore, which appears to flow from this clinical study of the question seems to be that the impulse given to the blood by the muscular action of the heart gives rise in it and in the vibratory structures containing it, to vibrations of a certain quality which result in that tone which is synchronous with cardiac systole and usually called the first sound of the heart, and that the largest share in this result must be attributed to vibrations in the blood itself, to produce which at a normal

[1] The 'Lancet,' November, 1849.

rate valvular support of the vibrating blood-columns is necessary. The study of some congenital cardiac malformations especially appears to support this conclusion, because with considerable parietal defects and bruits caused by such the sounds of the heart may be well heard so long as the division of the blood is fairly maintained by the valves. This conclusion from clinical observations and argument is essentially the same as that reached by the late Dr. Arthur Leared, formerly one of the physicians to the Great Northern Hospital. I cannot, however, agree with him when he writes that the events which occur in the ventricles and at the arterial orifices have no more to do with the generation of the sounds than "the vibration of a door [has] with the sound produced by air [passing] through its key-hole."[1] There is a difference in the noise made by a door slammed to and one pushed open. The former represents the second, the latter the first sound of the heart, and in both the character and distribution of the vibrations differ.

The conclusion I have drawn differs somewhat likewise from that arrived at by my late friend Sir Richard Quain, in that I cannot attribute so much importance as he did to the impact of the ventricular blood against the close semilunar valves only and the superincumbent blood-columns, although I think there can be little doubt that it is at this point that the most important portion of the vibrations arise which result in the production of the first sound of the heart. Dr. Leared appears to me to have attributed too much and Sir Richard Quain too little importance to the sound-producing qualities of the blood itself. The truth appears to lie between the views of these two observers and may include as a very subsidiary factor a note derived from the muscular contraction of the organ. The estimation of the last point, however, by the clinician is a very difficult matter.

[1] 'Essay on the Sounds caused by the Circulation of the Blood,' London, 1861.

I have purposely refrained from reference to the results of experimental physiology on this occasion, not because I underrate its great importance, but because it has been my desire to show that in the advancement of scientific medicine the careful study of the ready-made experiments which came under the cognisance of the clinician (a field open to all departments in the profession) may be fruitful of valuable results. The power to disintegrate factors, however, which belongs to the experimenting physiologist, renders his assistance necessary to a precise knowledge of the causes of vital phenomena. Some of these, and notably Halford in his valuable essay on the Action and Sounds of the Heart (1860), are largely in agreement with the conclusions set forth in this paper. They dissent from them chiefly in the greater importance which they attach to vibrations of the auriculo-ventricular valves and of the blood in the ventricular cavities.

II.

ON THE USE OF MERCURY IN THE TREATMENT OF CARDIAC FAILURE DUE TO ARTERIO-SCLEROSIS.[1]

Mr. President and Gentlemen,—The value of mercury in the treatment of disorders of the circulation was well recognised by the older physicians, but the zeal for its employment was not always according to knowledge. Consequently a generation arose which, following blindly in the footsteps of tradition, and not finding their expectations answered, proceeded to ban mercury as a dangerous or useless drug under all circumstances, and so impressed the public with this belated sagacity that even the acknowledged charlatan was forced to advertise his wares as free from that deleterious agent. One has only to mention the names of Withering and of Baillie, of Stokes and Graves and Gregory, however, to be certain that, whatever mistakes these distinguished men committed, they were the faults of strength, and that when they spoke positively of beneficial results obtained under certain circumstances they stated facts and opinions which required the respectful if discriminating attention of posterity. Posterity, however, for a

[1] A paper read before the Æsculapian Society of London on May 19th, 1900.

time was more discriminating than respectful, and it consigned in a great measure both these great authorities and their vaunted remedy to an unmerited oblivion. In the matter of mercury in the treatment of some forms of heart disease it is now beginning to revise its hasty condemnation.

It is not my intention on this occasion to consider the larger question of the use of mercury in the treatment of heart disease, but to limit myself to a consideration of its employment in that form of cardiac failure which is so frequently associated with the arterio-sclerotic changes connected with advancing life, and more particularly when this is coupled with that overwork for a means of livelihood which is the fate of many. I think I can do this most conveniently by quoting a specific instance and making it the peg on which to hang any general remarks I may have to offer.

A man, aged 67 years, an English labourer of the best type, calm, self-respecting, the father of a hard-working family, and of good physique but stiff and bowed down with continuous work and advancing age, had been under my observation for about five years in the out-patient department of the Great Northern Central Hospital. He had suffered during that time from a tachycardial form of cardiac arrhythmia with periods of amelioration and comparative sense of well-being, broken by the inevitable relapse into breathlessness, defective sleep, and scanty urination, but never reaching that greater depth of cardiac failure associated with progressive anasarca and effusion into the serous cavities of the body until December, 1899. He then returned as an out-patient, water-logged, and with a rapidly sinking heart. I advised him to enter the hospital, and by the courtesy of my colleague, Dr. E. Clifford Beale, he was placed under my care. By an oversight, however, I was not informed of his admission until a fortnight or so after that

event, during which time he was under the care of a house physician.

On admission into the hospital on December 20th the patient's temperature is stated to have been 96° F., and his heart pulse, so far as it could be counted with the stethoscope, 160, very irregular in force and in rhythm, and few beats reaching the wrist. He was somewhat cyanosed and orthopnœic, and had a cough. He had anasarca as high as the waist, and on his legs there were several foul sloughing sores. There was no detectable ascites and the urine was very scanty, and contained some albumin. A mixture containing 15 minims of tincture of strophanthus, 4 minims of solution of strychnine, and 10 grains of diuretin was ordered to be taken every four hours. One grain of calomel was likewise prescribed daily, and at bedtime he took 20 grains of bromide of potassium and 20 grains of trional. Saline aperients were likewise administered, and the patient was placed on admission diet. Ten days later there was no noteworthy improvement in his condition; the hypnotics were increased in power, and tincture of digitalis was prescribed instead of tincture of strophanthus.

On January 5th, 1900, fish was added to the dietary and a pill containing two grains of calomel was ordered to be taken at bedtime every night. Finding on the 9th that the condition of the patient continued critical I placed him upon ordinary diet, and prescribed three ounces of brandy, to be given in one-ounce doses and the last ounce at bedtime. I discontinued all hypnotics, and ordered the pilula diuretica of the hospital pharmacopœia to be administered three times a day. This consists of powder of digitalis, powder of squills, blue pill, and extract of hyoscyamus, of each one grain. On the 16th the patient was still restless at night, but the œdema of his legs had subsided to some extent, and although there was a little

recognisable serous effusion in his left chest, and the ratio between his heart and wrist pulse was as 150 to 100, the quantity of his urine had increased and it contained no albumin. By the 19th the ratio of his heart and wrist pulse was as 120 to 66 ; the impulse of the heart was stronger and its rhythm was regular ; the patient slept better and there was less evidence of pleural effusion. The urine within the next few days began to flow more freely until on the 27th it reached a maximum of 110 ounces, and the patient's general condition had improved in every way. On the 31st the diuretic pill was discontinued as the patient's gums had become slightly affected. The urine, however, continued to flow satisfactorily until February 12th, when it had fallen to 36 ounces, and on the next day the diuretic pill was resumed. Three days later it had reached 47 ounces, and, with some fluctuation, a maximum of 73 ounces on the 19th. The general state of the patient had meanwhile continued to improve, and on the 25th the pill was again omitted, and was resumed on March 3rd because of a fall of the urinary secretion to 15 ounces as nearly as could be calculated. Four days later the quantity had again risen to 50 ounces, and the patient's general state was most satisfactory. All anasarca and serous effusion had disappeared, the force and rhythm of his heart had improved, and the discrepancy between the heart beat and the pulse at the wrist had been reduced, at times very greatly, such ratios as 90 to 72, 100 to 84, and 104 to 88 being noted. The patient also ate well, and slept from seven to ten out of the twenty-four hours without any other aid than his nightcap of one ounce of brandy. The diuretic pill was discontinued and again resumed for a few days at a time, and on the 27th the patient was discharged on account of the demand for beds. He was then in every way comfortable, and was free from all the evidences of cardiac failure with

which he had been admitted. The heart, however, still manifested its arrhythmical instability, and he was advised to rest as much as possible, and to live as generously as his family could afford to allow him to do. He returned to my out-patient clinic in May free from œdema or subjective distress, but with increased tachycardial arrhythmia, and stated that he could not "get along" without taking a few of his "pills" from time to time.

I have too great a regard for the reputation of mercury as a therapeutic agent in cases such as that just related to claim for it a greater share in the success attending its employment than an impartial review of the circumstances seems to justify. It has been pointed out alike by Baillie, by Stokes, and by others, that it is the combined operation of mercurials and cardiac stimulants which influences for good the majority of cases of cardiac failure such as that described. To these, however, must be added, in the case of persons in the circumstances of my patient, the rest, warmth, food, and general care which they receive on admission to a hospital. Without these influences it may safely be asserted that neither mercury nor digitalis would have had any result in the present instance. These, however, while they enabled the pill to act beneficially did not disprove the fact that there was an efficacy to be expected from the combination which would probably not have been attained by the use of one drug without the other, or, indeed, by the unduly preponderant use of digitalis as compared with the mercurial. For my present purpose it is fortunate that this point was also illustrated in this case. On admission a powerful cardiac stimulant and diuretic was prescribed, together with a grain of calomel separately at bedtime. A fortnight later, progress being unsatisfactory, digitalis was employed instead of strophanthus, and an additional grain of calomel was prescribed to be taken

at bedtime. It was not, indeed, until more than a fortnight after the simultaneous use of the drugs thrice repeated daily, and after the patient had been placed on full diet, and brandy made to take the place of his ordinary hypnotics, that the full effects of the drug were attained, and a urinary output which had fallen to 18 ounces, and even 15 ounces a day, rose to a maximum of 110 ounces. It could not, of course, be maintained at this high figure, although such amounts as 93, 75, 81, 85, and 69 ounces were recorded. For it may be noticed in water-logged cardiac cases that when the methods employed begin effectually to squeeze the human sponge a copious drip takes place, but the human body obeys under the circumstances the general law of sponges, which once squeezed fairly dry have little more than their normal moisture to part with unless they again become more or less water-logged, as may happen. As Carlyle was fond of remarking, "You cannot get more out of a thing than there is in it." Even under recurrences of anasarca, however, this case shows that a steady recourse to the combined drugs may again be expected to relieve the patient, and, as is stated at the conclusion of the record, the patient himself was so convinced of the value of his pill that he insisted on keeping it within reach. In his case I believe that he was justified in his confidence, although a like touching faith may be frequently observed under circumstances in which a wholesome scepticism would be more in place.

A few remarks may be made upon other possible causes of success in the treatment of the case related, and upon the value of the combination employed. In connection with the first point it is important to note that the kidneys of the patient, although congested, were essentially healthy, as it has been found by those who have used mercury in the treatment of heart disease that chronic renal disease, with the impeded elimi-

nation involved, is inimical to a sufficiently prolonged exhibition of the drug to secure beneficial action. In the next place all the agents in the compound pill prescribed were steadily pushed under favourable circumstances as to posture, food, and warmth until a definite result was secured. It is permissible to refer to this point because it is so frequently observed that a rational course of treatment has been conceived and initiated without being pushed home with sufficient persistence and vigour to secure success. In the third place, the patient was either philosophical enough or stupid enough to allow of the mental factor in his case being eliminated, and thus prevented from upsetting the balance of his circulation by the intrusion of the emotions. Although the notes taken by the resident physician comprehensively state that while cardiac failure was at its worst the patient was "off his head" (as often happens under similar circumstances), he slept well and long when his anasarcous discomforts and the impediment in his circulation diminished and quite recovered his mental equilibrium. In sleep, while the vessels of the brain diminish in calibre, the withdrawal of the psychical sphere from active operation appears to release the general vascular periphery, somatic and visceral, and thus to relieve the labour of the heart, which, like the rest of the organism, enters refreshed on waking upon the work thrown upon it during the day.

The last point which may be mentioned as having conduced to the favourable issue of the case is that, although the patient was admitted to hospital on December 20th, 1899, placed upon full diet and given systematic and persistent treatment by the diuretic pill, and an allowance of brandy without hypnotics on January 9th, 1900, and was practically convalescent towards the end of the same month, he was not discharged from hospital until March 29th. In other words, he was two months in

hospital under constant observation and with every comfort after convalescence was established. A similar case with equally happy results had been under my care in the hospital a year previously, and although this patient returned to the ward for a short time while the patient whose case I now describe was under treatment there has been no recurrence of his extensive dropsy since his convalescence. He also was kept for a long time in hospital. This patient was as old as the one whose case I now record, and had even harder arteries and a dilated and arrhythmical heart, and the full consolidation of his convalescence appeared to have established a compensation even under these circumstances which had successfully coped with the wear and tear of another year.

As regards the efficacy of mercury administered in the combination indicated and under the circumstances under consideration, Sir Thomas Watson,[1] discussing the treatment of "anasarca," remarks: "Sometimes a combination or farrago of diuretic substances proves more efficacious than larger doses of any of the ingredients administered singly, and the operation of some of these combinations is undoubtedly quickened or exalted in many instances by the addition of mercury—a fluid drachm of the officinal solution of the bichloride in each dose in a mixture, or small quantities of calomel or of blue pill when the medicines are given in a solid form. A very useful pill of this kind, much recommended by the late Dr. Baillie, consists of three or four grains of the pilula hydrargyri, mixed up with one grain of the dried powder of squills, to be given twice or thrice a day. Dr. Baillie states that squills and digitalis are much less effectual by themselves than when combined with mercury." The formula of this pill, which is given in the second and third editions of Dr. George Gregory's

1 'Lectures on the Principles and Practice of Physics,' vol. ii, p. 597.

'Elements of the Theory and Practice of Physic,' is three grains of pilula hydrargyri and one each of powder of squills and of digitalis, to be taken at midday and in the evening. As the formula is not given in the first edition which was published in 1823—the year in which Matthew Baillie died—it is probable that the usual posthumous extension of Gregory's armamentarium took place after the death of his great and good contemporary. But Baillie would have been the first to acknowledge that the principle of the combination of co-operative elements was as old as the world itself, and exemplified by all the healing waters known to bathers and physicians from and prior to the days of the name-father of our Society down to those of the last bath-doctor who has lost his mental equilibrium in enthusiastic praises of a new spring. Withering, indeed, writes of the therapeutic relation of squills to digitalis thus: "Next to the lancet, I think nothing lowers the tone of the system more effectually than the squill, and consequently it will always be proper in such cases to use the squill, for if that fail in its desired effect it is one of the best preparations to the adoption of the digitalis."[1] We now know that the active principle of squills acts much in the same manner as that of digitalis and that neither "lowers the tone of the system" except when administered in excessive doses or after too protracted use, but the above quotation shows that Withering's practical sagacity had detected the aid which one at times could lend the other. At page 170 of the same essay a prescription of Withering is given in which two grains of "grey mercury" were combined with twenty of powdered digitalis leaves and divided into fourteen pills of which one was to be taken twice a day—evincing, surely, quite a modern timidity of mercury. I have not, however, met with any actual combination

[1] 'An Account of the Foxglove and some of its Medical Uses,' 1775, p. 190.

of all these ingredients in one pill in Withering's work, and we may therefore assume that the attribution of that combination to the clinical acumen of Baillie is correct, but I have not so far met with a note of it in his works, which are well worthy of perusal even to-day. The addition of a grain of hyoscyamus—the "Guy's pill" used at the Great Northern Hospital—was probably not intended by its originator or originators to be other than a corrective to the intestinal effects of the other drugs, but it is just possible that as a drug of the belladonna group it may not be without influence upon the circulation when administered for a length of time. I have, indeed, occasionally used extract of belladonna in the pill instead of hyoscyamus on this principle, and especially when there is a bradycardial rather than tachycardial tendency in the arrhythmia so frequently associated with arterio-sclerosis. The beneficial influence of mercury in the combination is, I think, clinically indisputable, but the discussion of the precise manner of its operation might lead to much, and perhaps not very useful, speculation. A fact, however, among the effects of mercurials to which Sir William Broadbent (to whom I attribute a considerable share in the revival of the medical use of mercury) attaches much importance is its lowering the tension of the pulse. How this is brought about—whether by the elimination from the blood of waste material which has a spastic effect upon the arterioles or by direct dilatation of the peripheral vessels in the process of its own elimination—it is not necessary at present to inquire and is very difficult to determine. That the permeability of peripheral vessels by a lessening of their resistance is secured appears to be clinically demonstrable. This being so it is not difficult to imagine, and is indeed permissible to suppose, that the combination of mercury (a peripheral dilatant) with digitalis and squills (which are in part

central stimulants as well as peripheral contractors) constitutes it a rationally indicated adjuvant to the action of the latter in cardiac failure due to arterio-sclerosis. Like many other happy therapeutic combinations, however, it was probably at first employed in this connexion empirically, even by men of the calibre of Withering and of Matthew Baillie.

Upper Berkeley Street, W.

PRINTED BY ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20, HANOVER SQUARE, W.